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Graded Activity Versus Core Stabilization Exercises in Management of Pain and Function in Subjects with Chronic Non Specific Low Back Pain

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ABSTRACT

Background and Objectives: Chronic Non Specific Low Back Pain (CNLBP) is a common musculoskeletal condition without a specific identifiable cause, affecting without a specific identifiable cause, affecting a substantial proportion of the global adult population. It can be treated using Core Stabilization Exercises to improve pain and function but Graded Activity is different from Core Stabilization Exercise and it is not much practiced in clinical settings for CNSLBP. The objective of the study is to compare the effectiveness of GA and CSE in management of pain and function in subjects with CNSLBP.

Methods: A total of 96 subjects with CNSLBP for reducing pain and improving function were included in the study. They were allocated into two groups by using Systematic Randomised sampling method. In Group A (n=48) subjects were treated with GAE, whereas in Group-B (n=48) subjects were treated with CSE. Pain was evaluated by using VAS and function disability was evaluated by using ODI.

Results: Independent "t" test was used to compare the mean significance difference between continuous variables. Paired "t" test was used to assess the statistical significance between pre and post-test scores. Statistical analysis of this data revealed that both groups showed significant improvement in parameters when compared within groups, whereas in between Groups comparison GA Group showed better improvement compared to the CSE.

Conclusion: In Six weeks of intervention, both groups were shown statistically significant improvement in post-test values. However, GAE Group is more effective when compared to when compared to CSE, in subjects with Chronic Non Specific Low Back Pain.

Keywords: Chronic Non Specific Low Back Pain, Graded Activity, Core Stabilization Exercises

INTRODUCTION

Low Back Pain (LBP) is considered as one of the commonest problems, in which pain felt in the lumbosacral spinal and paraspinal regions which encompass the buttocks and upper thigh. LBP is one of most common medical problems that lead to absence from work, the disability arising from this pain resulting in significant economic impact. In addition, it can lead to activity restrictions such as carrying objects, sitting or standing for a long time, twisting and squatting which can result in participation limitation and functional disability.[1]

Non Specific Low Back Pain (NSLBP) is characterized by pain for more than one day located between the lower rib margins and the buttock creases. The pain does not have a definite cause and cannot be traced by a specific event [2]. It can be acute, sub-acute or chronic; this subdivision is based on the duration of the back pain. Acute low back pain is an

episode of low back pain for less than 6 weeks, sub-acute low back pain between 6 and 12 weeks and chronic low back pain for 12 weeks or more. [3]

The estimated global incidence of Low Back Pain is 6.3% and 15.4%. In India, Incidence of low back pain is also alarming; nearly 60% of the people have significant low back pain at some time or the other in their life span. [4] The prevalence of Non Specific Low Back Pain in Indian population has been found to range from 6.2% to 92% and found to increase with age and to be more common among females. [5]

The main causative factors that can cause low back pain are poor posture while sitting or standing, heavy manual lifting, sustained postures, and prolonged Trunk flexion. [6] Prolonged sitting leads to increased body discomfort in the Neck, Shoulder, Upper Back, Low back, and Buttocks, while prolonged slumped sitting may be related to internal oblique or transverse abdominis muscle fatigue, compromising the stability of the spine and making it vulnerable to injury. [7]

Low back pain is also caused by problems with structures in the back, such as the joint, discs, muscles, tendons and ligaments. These tissues may be pulled, strained, stretched or sprained and rapidly produce an inflammation with the release of inflammatory chemicals such as cytokines and/or chemokines. This type of back pain is not caused by cancer, infection, a fracture or a very few cases of persistent low back pain. [8]

The pathophysiology of Non Specific Low Back Pain (NSLBP) is thought to involve complex structures in the body, including the muscles, ligaments, discs, and nerves in the lumbar spine region. When the deep spinal muscles are affected, this can lead to alterations in the biomechanics of the lumbar spine, such as decreased stability and increased stress on certain structures resulting in pain and discomfort. Furthermore the Psychological and emotional factors, such as Stress, Anxiety, and Depression plays a role in Developing and persisting NSLBP [9]

The deep muscles of back and trunk are attached to the superficial back line through thoracolumbar fascia and these deep muscles and fascia of the trunk form a continuous musculofascial corset-like system. Chronic LBP is caused by deep muscle dysfunctions and altered fascia structures, which causes musculofascial corset-like system to fail, which leads to changes in fascia .Several studies have shown that decreased strength in the deep muscles is accompanied by increased activation in the superficial muscles which can affect the tensegrity of the fascia along SBL in individuals with LBP. [10]

Risk factors for an episode of nonspecific low back pain include physical risk factors (e.g., prolonged standing or walking and lifting heavy weights), an unhealthy lifestyle (e.g., obesity), psychological factors (e.g., depression and job dissatisfaction), and previous episodes of low back pain. [11] Patients with sudden-onset acute low back pain, performance of manual tasks (e.g., those involving heavy loads or awkward postures) and distraction during an activity or task were identified as triggers of a new episode of pain. [12]

Diagnosis of nonspecific low back pain is done only after ruling out specific causes of spinal and non spinal origin. Detailed history taking and physical examination can exclude specific disorders of spinal conditions and non spinal conditions. Attention to red flags should be considered in history taking, like history of cancer, infection, fever, unexplained weight loss, and long-term glucocorticoid use. [13] In the case of LBP with radiculopathy, a neurological examination should be done to rule out limb weakness, loss of sensation, and decreased reflexes. [14]

The conservative management is broadly divided into pharmacology and physiotherapy. The pharmacological compounds include, Paracetamol, NSAID'S, Muscle relaxants, Opioids, Antidepressants, repair of the Nucleus pulposus using Hydrogels. [15] The physiotherapy includes, Manipulations, Mobilization, various therapeutic exercises and modalities consists Traction, Interferential therapy, Hydro Collateral Packs, Ultrasound, TENS, Pulsed Short Wave Diathermy. [16]

According to the guidelines on management of LBP, [17] there is a wide variety of approaches recommended for chronic LPB such as supervised exercises and cognitive behavioral therapy. Supervised exercises incorporated in physical therapy treatment (strengthening, stretching and motor control exercises) and graded activity exercises under the principles of cognitive behavioral therapy have been shown to be no more effective than other forms of exercise in reducing intensity of pain and disability in patients with chronic LBP. [18]

Graded Activity exercises use a cognitive-behavioral approach to increase activity tolerance by addressing pain-related fear, kinesiophobia, and unhelpful beliefs and behaviors concerning back pain while addressing physical impairments such as impaired endurance, muscle strength, and balance. [19,20] Then, Graded Activity consists of three phases: measuring functional capacity, educating in the workplace and providing an individual program of sub- maximal exercise that is gradually increased. [21]

The Graded Activity program, which was initially developed by Lindström et al. [22,] recommends the use of an individualized and submaximal exercise program, with educational support in order to enhance self-trust and tolerance to effort. Additionally, a graded activity program focuses on identifying specific activities the patients have difficulty performing due to LBP and goals were formulated to serve as references. [23] The treatment principle was guided by the patient's feedback with respect to functional abilities.

Core Stability is commonly used to refer to the ability of the core muscles to stabilize the lumbar spine and pelvic girdle during static postures and dynamic movements. Improving of the core stability is to reduce pain and disability by recreating normal muscle function to increase spinal stability, improve neuromuscular control within the Lumbopelvic region, induce inter-segmental stiffness and prevent shear force that causes injury to the lumbar spine. [24]

During Low Back pain the physiology of these core muscles gets Altered, these muscles gets weaker and atrophied, and leads to Altered or faulty Biomechanics. As a result, Pain and Muscle spasm gives rise. The Core consists of Transverse abdominals, Para spinalis and Gluteal, the Diaphragm and Pelvic floor and Hip Girdle musculature as the bottom. Training of these specific muscles gets strengthened and also to maintain functional stability. [25]

The co-activation of the Transversus Abdominis and LM muscles is emphasized in Core Stability Exercises, which are based on the motor learning method. By increasing Intra-abdominal pressure, these deep stabilizing muscles stiffen the lumbar spine and give the spine segmental stability. In LBP patients, Core stabilization exercises have shown to increase stability index, successfully correct postural abnormalities, and reduce pain and disability. [26]

NEED OF THE STUDY

Chronic non-specific low back pain is a prevalent and debilitating condition that affects a significant portion of the population. Therefore, identifying effective treatment approaches is crucial to improve the quality of life for affected individuals. There are many studies available for treating chronic Non specific Low Back Pain among them, Graded Activity and Core Stabilization Exercises have proved to be effective in Chronic Non Specific Low Back Pain. By studying the effectiveness of these interventions health care system, can allocate their resources more effectively, focusing on treatment that have demonstrated positive outcomes, reducing unnecessary expenses and improving patient care, However there is Limited literatures in their comparison, Hence need of the study arises.

OBJECTIVES OF THE STUDY

1. To determine the Effect of Graded Activity on reducing pain and improving function in subjects with Chronic Non Specific Low Back Pain

2. To determine the Effect of Core Stabilization Exercises on reducing pain and improving function in subjects with Chronic Non Specific Low Back Pain

3. To determine the Effectiveness of Graded Activity in comparison to Core Stabilization Exercises on reducing pain and improving function in subjects with Chronic Non Specific Low Back Pain

METHODOLOGY

STUDY DESIGN: Quasi Experimental Study

ETHICAL CLEARANCE AND INFORMED CONSENT: The study protocol was approved by the Ethical Committee of GSL Medical College & General hospital (Annexure I), the investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participate in the study (Annexure-II). All the participants signed the informed consent and the rights of the included participants have been secured.

STUDY POPULATION: Subjects clinically diagnosed with Chronic Non Specific Low Back Pain by an Orthopaedician.

STUDY SETTING: The study was conducted at Department of Physiotherapy OPD, Tertiary Care Teaching Hospital Rajamahendravaram.

STUDY DURATION: The study was conducted during the period between 1st August 2023 to 31st July 2024

SAMPLING METHOD: Systematic Randomized Sampling

INTERVENTION DURATION: Six weeks (12, sessions, 2 sessions / week)

SAMPLE SIZE: A Total of 100 Chronic Non Specific Low Back Pain subjects were screened in that 96 subjects were recruited who are willing to participate in the study, taken the consent form, from the patients. These 96 subjects were randomized in to either Graded Activity or Core Stabilization Exercises.

GROUP A: Graded Activity along with Conventional Physiotherapy (48 subjects) **GROUP B:** Core Stabilization Exercises along with Conventional Physiotherapy (48 subjects)

MATERIALS USED:

1. Consent form
2. Data Collection sheet
3. Electrical Aerobic treadmill
4. Chair
5. Exercise Mat or Bed Sheet
6. Foam Or Pillow
7. Hot moist pack
8. Thera-Band

CRITERIA FOR SAMPLE COLLECTION
INCLUSION CRITERIA

- Subjects clinically diagnosed as Chronic Non Specific Low Back Pain Referred by Orthopaedician.
- Low Back Pain more than 3 months.
- Both Male and Female Participants were included in the study.
- Age Group between 18 to 65 Years.
- Pain over the back region of spine.
- Functional Disability noted in Subjects.
- Patients Willing to Participate in the Study.

EXCLUSION CRITERIA

- Known or Suspected serious spinal pathologies such as Fractures, Tumors, Inflammatory, Rheumatologic disorders, or Infective diseases of the spine.
- Nerve root compromise diagnosed by a radiologist through magnetic resonance imaging.
- History of previous spinal surgery.
- Comorbid health conditions that could prevent active participation in the exercise programs such as High Blood pressure, Pregnancy or Cardio-Respiratory illness.
- Spondylolisthesis, Spondylosis, Ankylosing Spondylosis, Osteoarthritis.
- Neurological disorders such as CVA, Parkinson's diseases.
- Acute infections or Acute Systemic disorders and Metabolic or Vascular disorders.
- Non coope
- rative and Psychiatric Subjects.

STUDY TOOLS AND OUTCOME MEASURES

1. Pain intensity was measured by the Visual Analogue Scale (VAS)[27]
2. The Functional activites was measured by the Oswestry Disability Index (ODI)[28]

INTERVENTION PROCEDURE

Graded Activity Exercise Protocol[29]: Graded Activity consisted of individual, progressively challenging sessions aimed at improving physical fitness through sub-maximal exercises. The program included aerobic training on a treadmill and strength exercises for the lower limbs and trunk. To determine the appropriate load for strength training, a 10-repetition maximum test was performed. During the first two weeks, participants exercised at 50% of their maximum load. The load was then increased to 60% in the third and fourth weeks, and to 70% in the final two weeks. Heart rate (HR) was monitored using the Karvonen formula (HRmax = 220 – age) for sedentary individuals: Exercise HR = Resting HR + 70% to 80% of maximum HR. In addition, a Hot Moist Pack was applied to the participants for 15 minutes. The participants were asked to perform two sessions of Graded Activity per week for 6 weeks, each lasting 1 hour, under the supervision of a physiotherapist.

Exercise	Position	Sets/duration
Aerobic training on the treadmill	5-minute warm-up with speed of 5-8km/h; 20-minute sub maximal training at 70-80% maximum heart rate; 5-minute slow-down with Gradual Speed Reduction	
Lower limbs strengthening	Exercise for the quadriceps in sitting position; Exercise for the hamstrings instanding position	3 sets of 12 repetitions for each limb. Intervals between series of 30 seconds.
Trunk strengthening	Exercises for the erector spinae inventral decubitus: trunk extension.	3 sets of 10 repetitions intervals between series of 30s

PATIENT PERFORMING AEROBIC TRAINING ON THREAD MILL

PATIENT PERFORMING QUADRICEPS STRENGTHENING EXERCISE

PATIENT PERFORMING HAMSTRING STRENGTHENING EXERCISES

PATIENT PERFORMING TRUNK STRENGTHENING EXERCISE

Core stabilization exercises group[30]: - Subjects were allocated to this group were managed with core stabilization exercises targeting deep muscles of the abdomen. The "cat" and "camel" stretches is included in the warm- up.

Subjects in this group received Hot Moist Pack was applied for duration of 15 minutes. Subjects were asked to perform Core Stabilization, 2 sessions per week for 6 weeks for 1 hour under Supervision by the Physiotherapist.

PATIENT PERFORMING TRUNK STRENGTHENING EXERCISE

PATIENT PERFORMING CAT AND CAMEL EXERCISE

PATIENT PERFORMING BIRD DOG POSITION

PATIENT PERFORMING FRONTAL PLANK EXERCISE

PATIENT PERFORMING SIDE PLANK EXERCISE

PATIENT PERFORMING PELVIC FLOOR EXERCISE

PATIENT PERFORMING WIND SHIELD WIPER EXERCISE

PATIENT PERFORMING WOBBLE BOARD OBLIQUE TWIST

PATIENT PERFORMING THERA-BAND REVERSE WOOD CHOP

PATIENT PERFORMING GIAPHRAGMATIC BREATING EXERCISE

PATIENT PERFORMING SINGLE LEG STANDING

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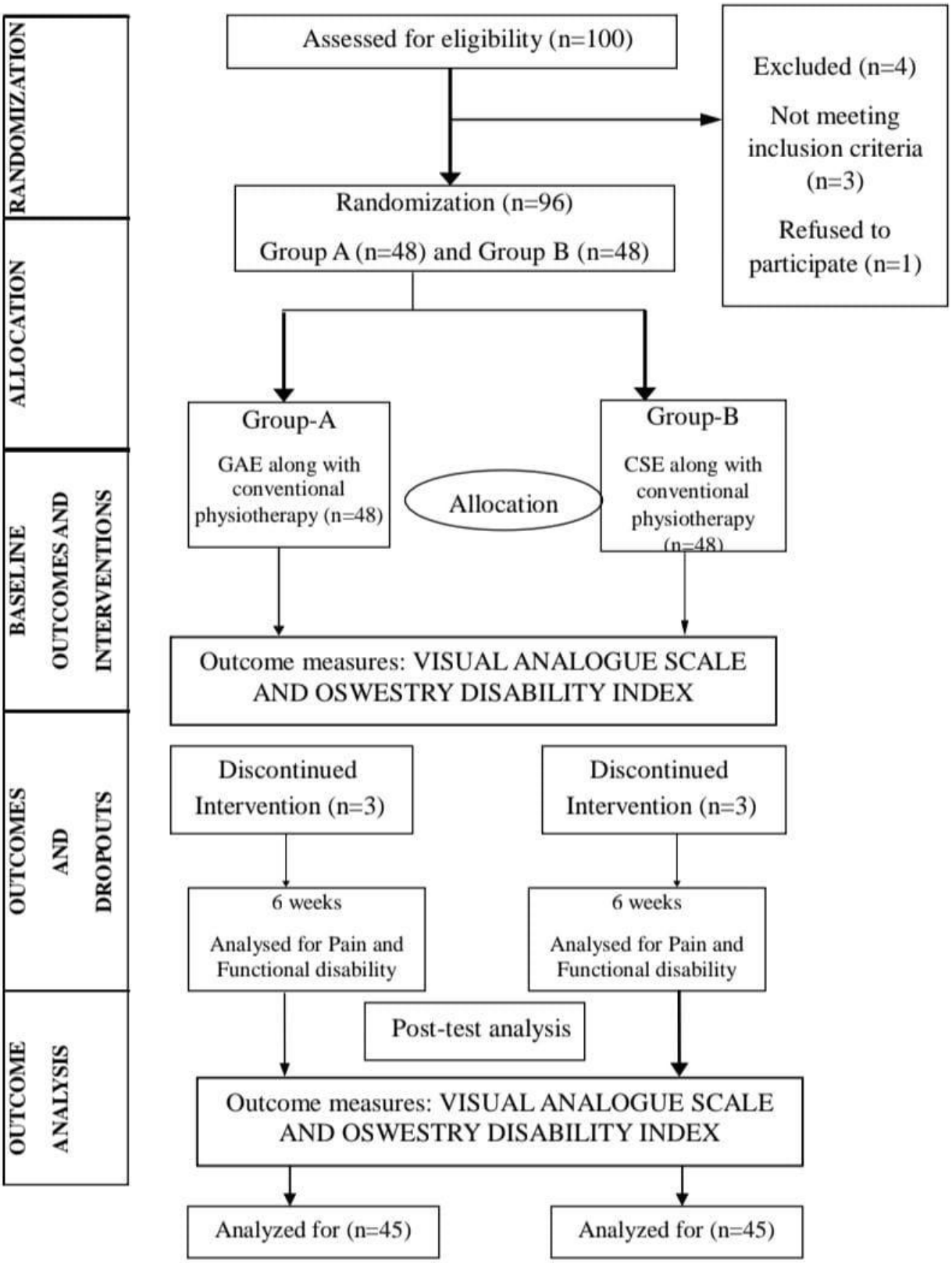
PATIENT PERFORMING TANDOM WALKING

STUDY ALGORITHM



STATISTICALANALYSIS

All Statistical analysis was done by using SPSS software version 20.0 and Microsoft excel-2019. Descriptive data was presented in the form of mean+/- standard deviation and mean difference percentages were calculated and presented.

Data also tabulated and Graphically represented.

Within the groups: Paired student "t" test was performed to assess the statistical difference within the groups for Pain and Function from pre-test and post-test values.

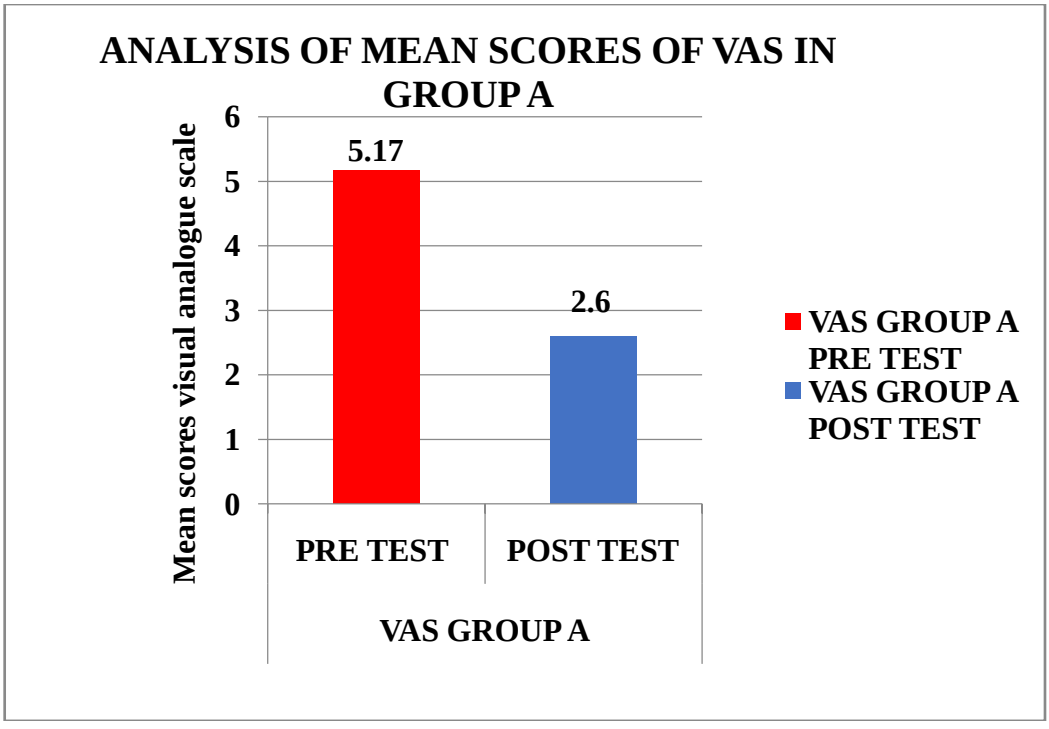
Between the groups: Independent student "t" test was performed to assess the statistically significant difference in mean value between the groups for Visual Analogue Scale for Pain and disability index (ODI) for function.
For all statistical analysis, $p \leq 0.05$ will be considered as Statistically Significant.

TABLES AND GRAPHS

Analysis Of Mean Score Of Visual Analogue Scale From Pre Test To Post Test Within The Group A

GROUP		MEAN	SD	P-VALUE	INFERENCE
GROUP A	PRE	5.17	0.716	<0.0001	Highly significant
	POST	2.6	1.095		

Table.1



Graph.1

Results-1:- The above Table and Graph shows that Mean scores of VAS within Group A from pre test to post test were found to be statistically significant ($p<0.05$)

Analysis Of Mean Score Of Visual Analogue Scale From Pre Test To Post Test Within The Group B

GROUP		**MEAN**	**SD**	**P-VALUE**	**INFERENCE**
GROUP B	**PRE**	**5.55**	**1.098**	**<0.0001**	**Highly significant**
	POST	**4.26**	**1.009**		

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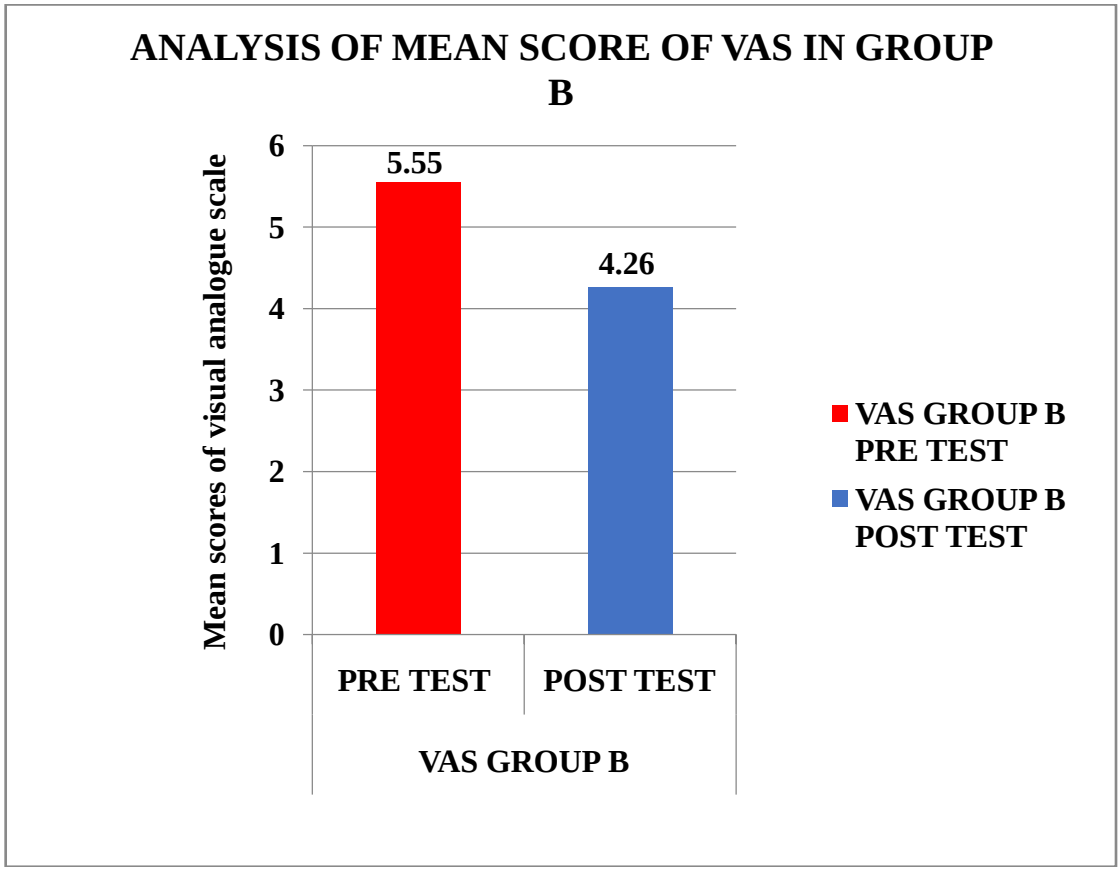
Table.2



Graph.2

Results-2:- The above Table and Graph shows that Mean scores of VAS within Group B from pre test to post test were found to be statistically significant ($p<0.05$

Analysis Of Mean Score Of Visual Analogue Scale From Pre Treatment Between The Group A And Group B

GROUP	PRE TREATMENT MEAN	SD	P-VALUE	INFERENCE
GRADED ACTIVITY	5.17	0.716	=0.055	Insignificant
CORE STABILIZATION EXERCISES	5.55	1.098		

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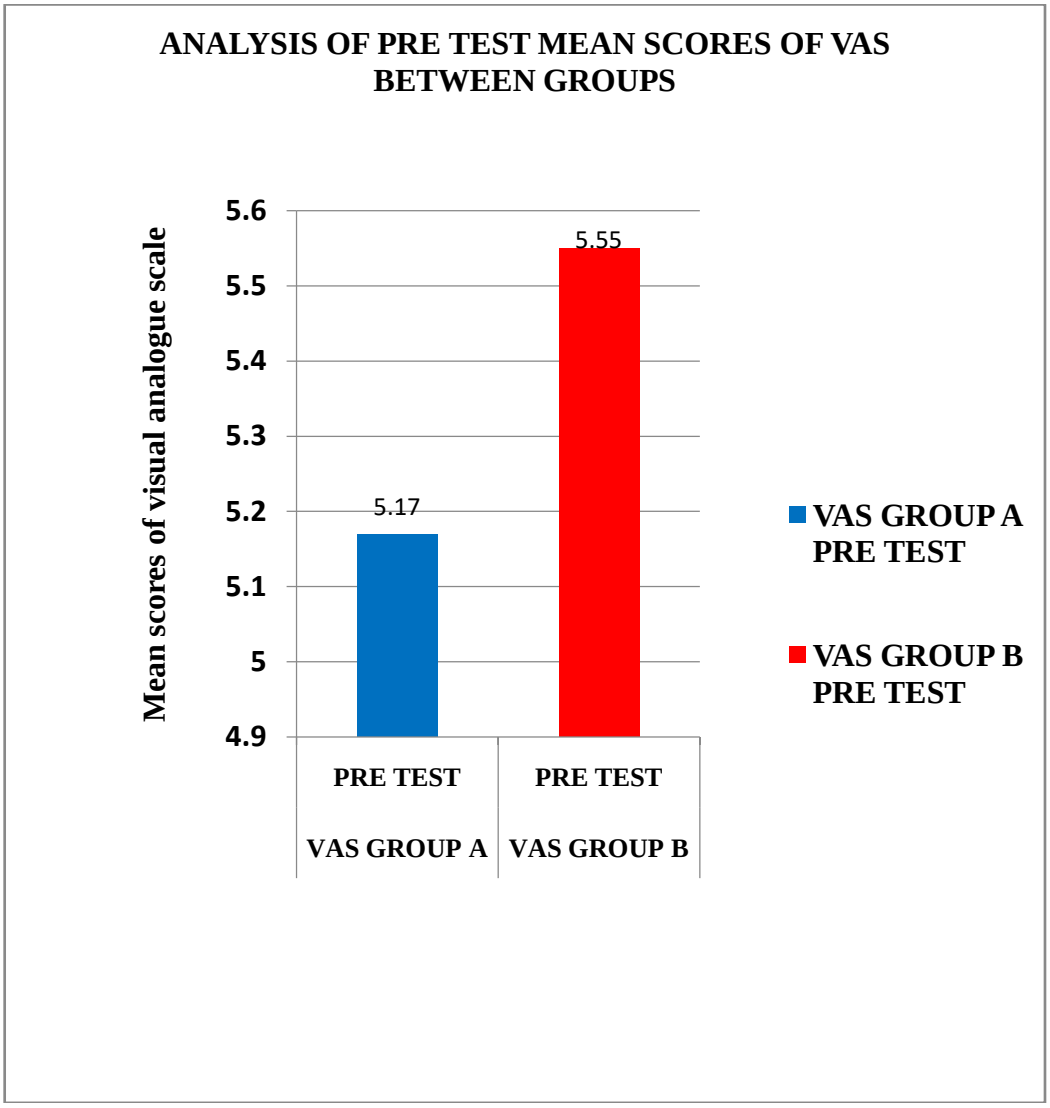
Table.3



Graph.3

Results-3:- The above Table and Graph shows the pre test Mean scores of VAS between Group A and Group B were found to be statistically insignificant (p=0.055)

Analysis Of Mean Score Of Visual Analogue Scale From Post Treatment Between The Group A And Group B

GROUP	POST TREATMENT MEAN	SD	P-VALUE	INFERENCE
GRADED ACTIVITY	2.6	1.098	<0.0001	Highly significant
CORE STABILIZATION EXERCISES	4.26	1.009		

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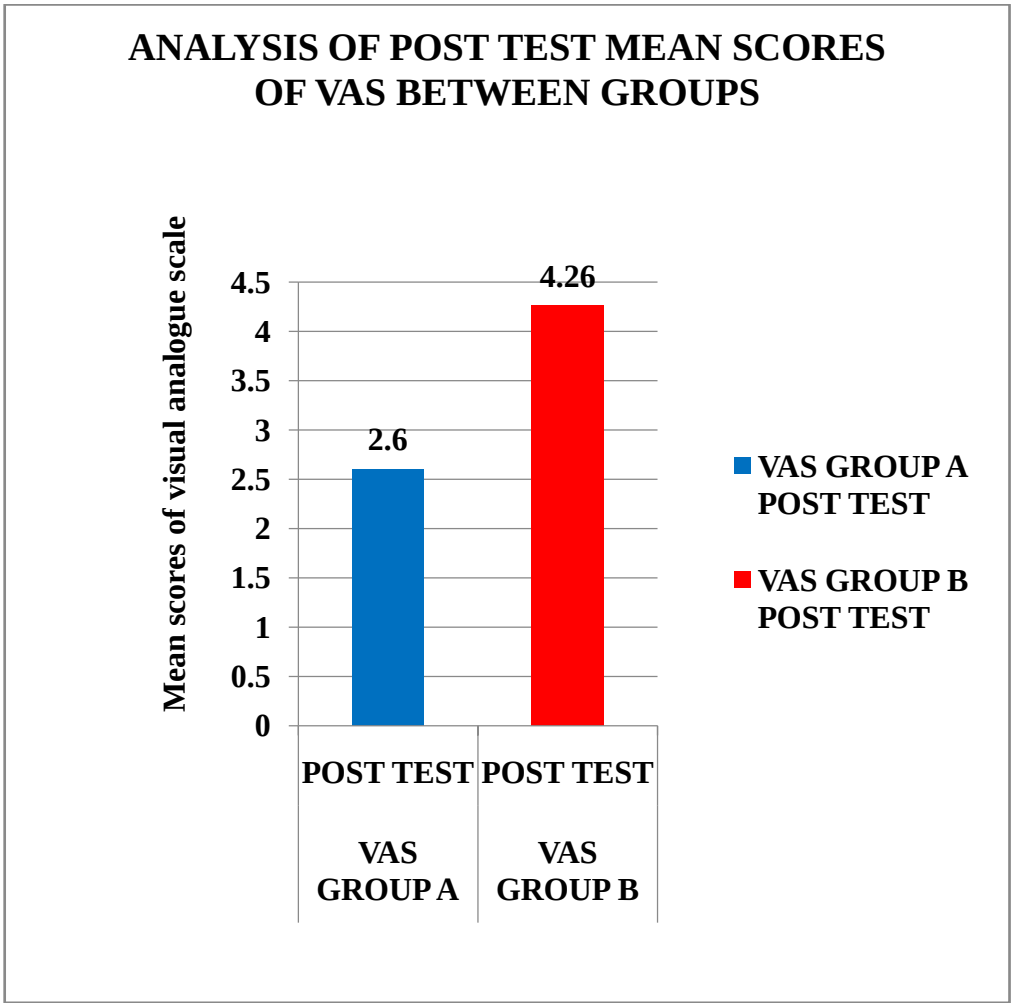
Table.4



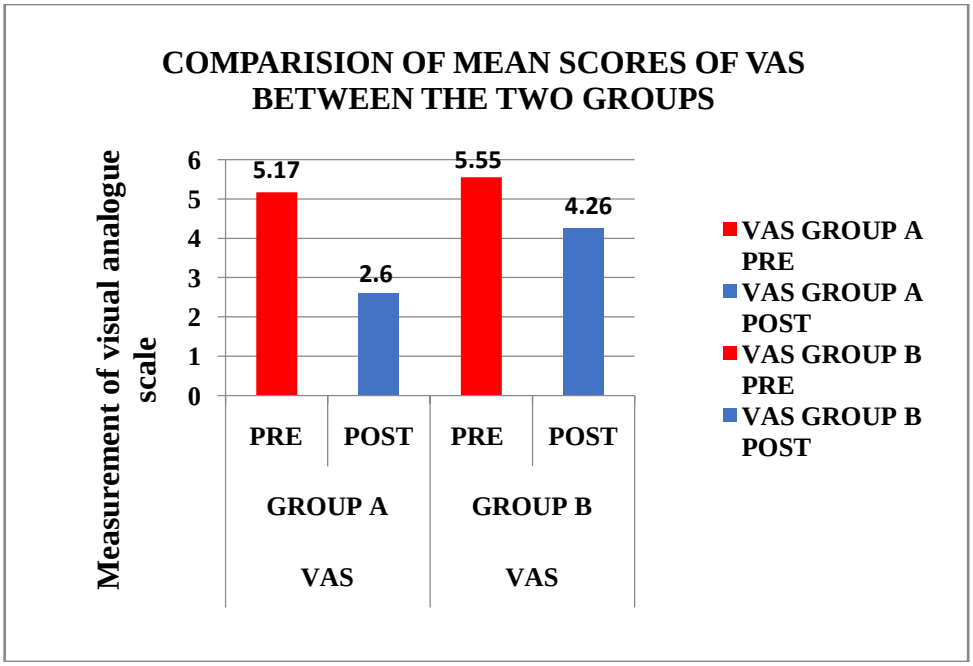
Graoh.4

Results-4:- The above Table and Graph shows the post test Mean scores of VAS between Group A and Group B were found to be statistically significant ($p<0.05$)

Comparision Of Mean Score Of Visual Analogue Scale Betweeen The Two Groups

Table.5

GROUP		MEAN	SD	P-VALUE	INFERENCE
VISUAL ANALOGUE SCALE PRE	A	5.17	0.716	=0.055	Insignificant
	B	5.55	1.098		
VISUAL ANALOGUE SCALE POST	A	2.6	1.095	<0.0001	Highly significant
	B	4.26	1.009		



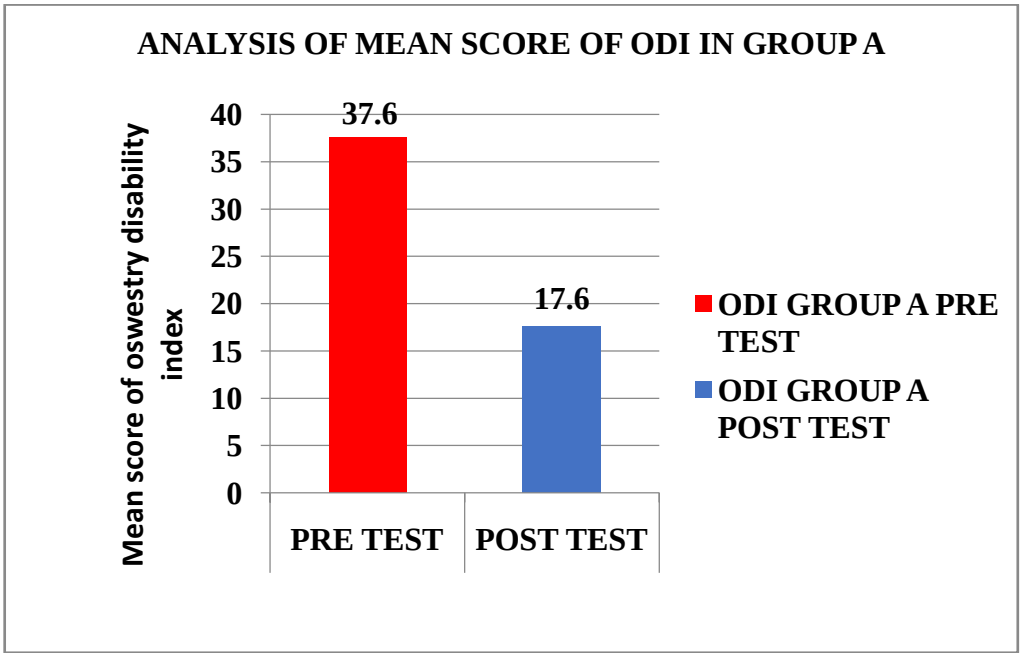
Graph.5

Result-9:- The above table and gragh shows the pre test between the groups were found to be statistically insignificant (p=0.055) and the post test between the groups were found to be statistically significant (p<0.005)

Analysis Of Mean Score Of Oswestry Disability Index From Pre Test To Post Test Within The Group A

GROUP		MEAN	SD	P-VALUE	INFERENCE
GROUP A	PRE	37.6	1.59	<0.0001	Highly significant
	POST	17.6	1.55		

Table .6



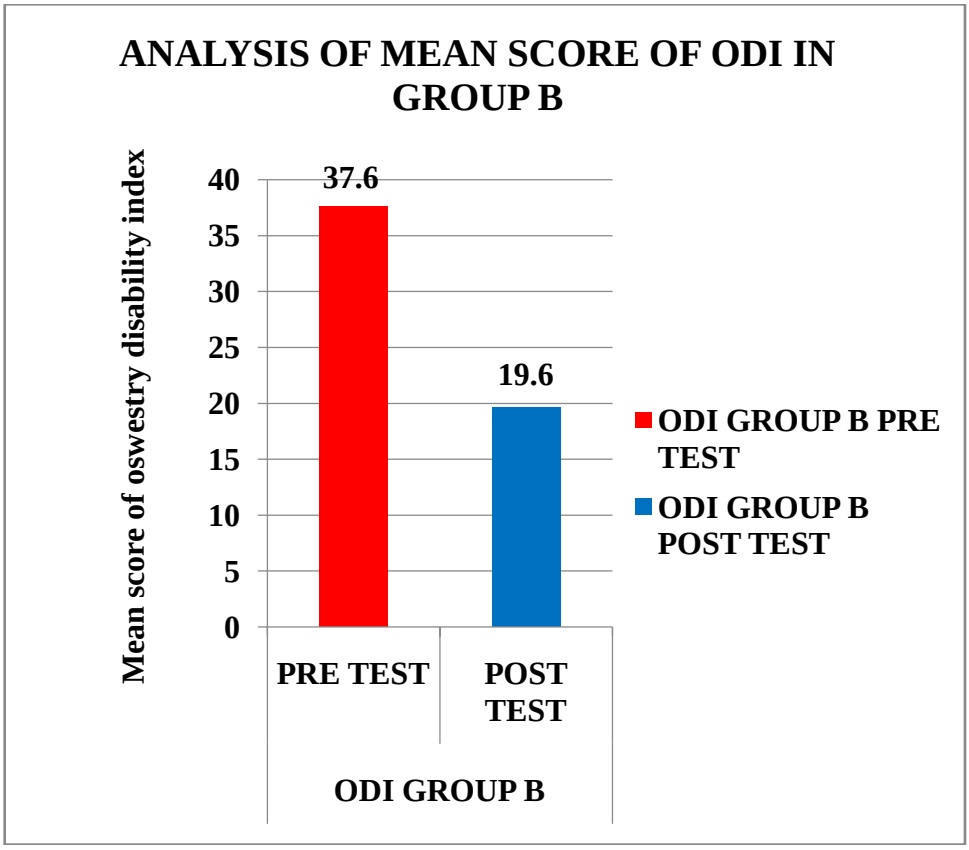
Graph.6

Results-5:- The above Table and Graph shows that Mean scores of ODI within Group A from pre test to post test were found to be statistically significant ($p<0.05$)

Analysis Of Mean Score Of Oswestry Disability Index From Pre Test To Post Test Within The Group B

GROUP		MEAN	SD	P-VALUE	INFERENCE
GROUP A	PRE	37.6	1.59	<0.0001	Highly significant
	POST	19.6	1.68		

Table.7



Graph.7

Results-5:- The above Table and Graph shows that Mean scores of ODI within Group B from pre test to post test were found to be statistically significant ($p<0.05$)

Analysis Of Mean Score Of Oswestry Disability Index From Pre Treatment Between The Group A And Group B

Table. 8

GROUP	PRE TREATMENT MEAN	SD	P-VALUE	INFERENCE
GRADED ACTIVITY	37.6	1.59	=1.000	Insignificant
CORE STABILIZATION EXERCISES	37.6	1.59		

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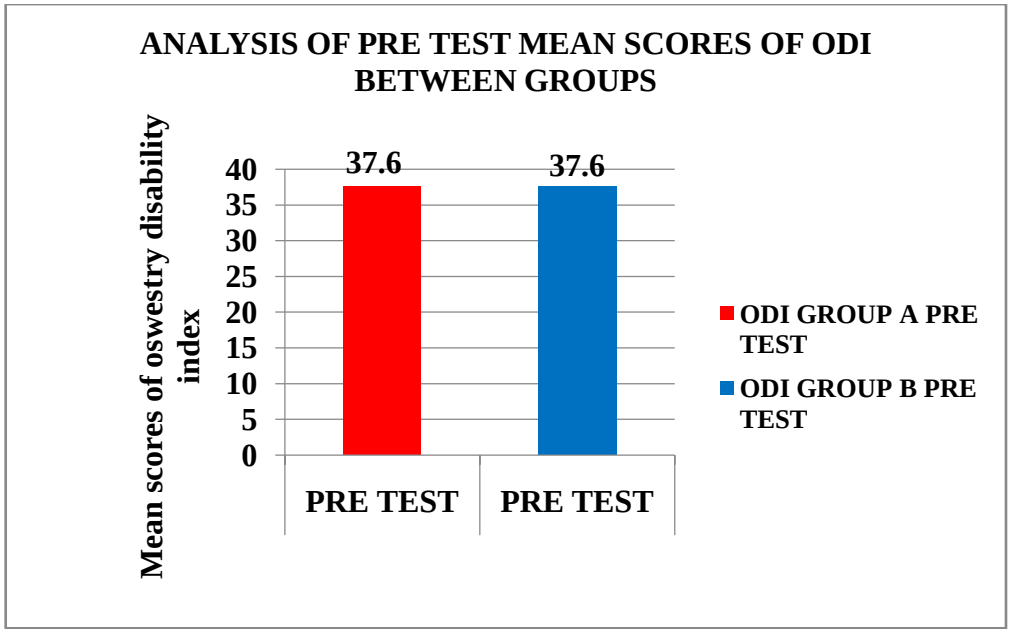


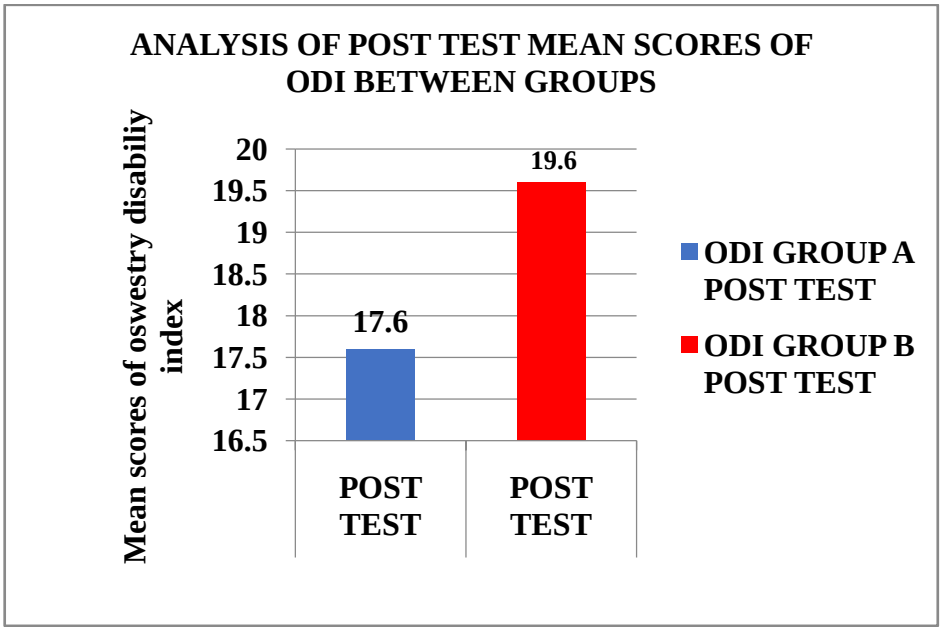
Graph.8

Results-7:- The above Table and Graph shows the pre test Mean scores of ODI between Group A and Group B were found to be statistically insignificant (p=1.000)

Analysis Of Mean Score Of Oswestry Disability Index From Post Treatment Between The Group A And Group B

Table. 9

Group	Post Treatment Mean	Sd	P-Value	Inference
Graded Activity	17.6	1.55	<0.0001	Highly Significant
Core Stabilization Exercises	19.6	1.68		



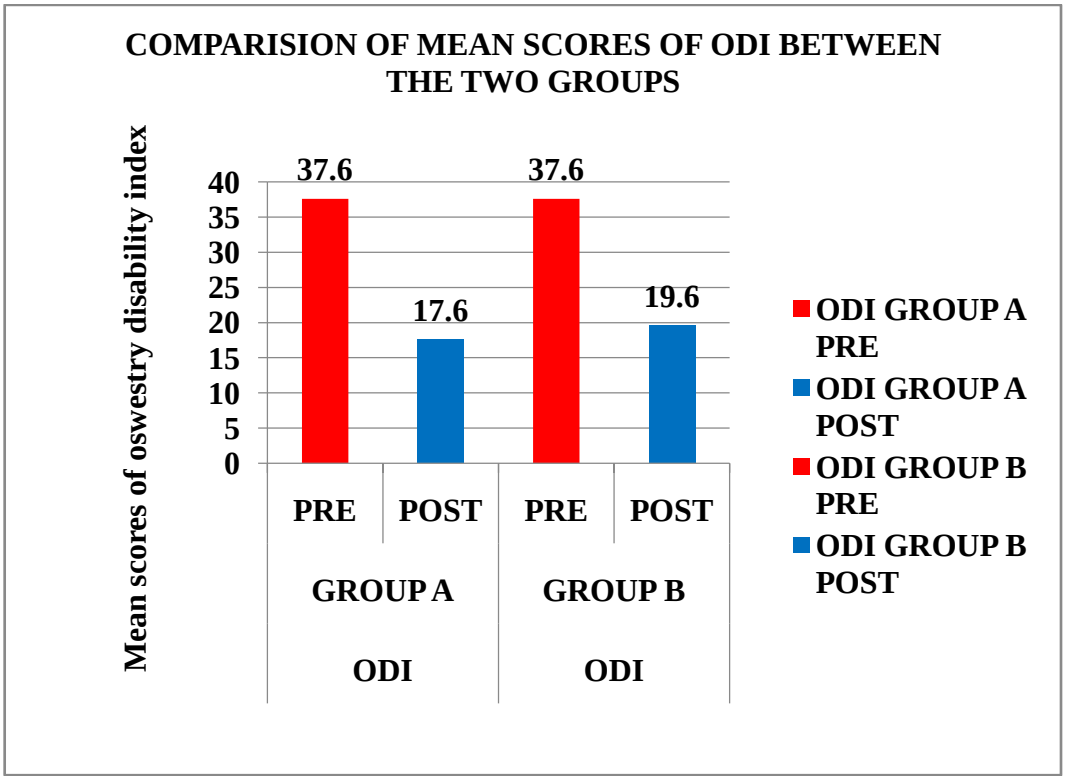
Graph. 9

Results-8:- The above Table and Graph shows the post test Mean scores of ODI between Group A and Group B were found to be statistically significant (p<0.05)

Comparision Of Mean Score Of Oswestry Disability Index Betweeen The Two Groups

Group		Mean	Sd	P-Value	Inference
Oswestry Disability Index Pre	A	37.6	1.59	=1.000	Insignificant
	B	37.6	1.59		
Oswestry Disability Index Post	A	17.6	1.55	<0.0001	Highly Significant
	B	19.6	1.68		

Table.10



Graph.10

Result-10:- The above table and gragh shows the pre test between the groups were found to be statistically insignificant (p=1.000) and the post test between the groups were found to be statistically significant (p<0.005)

RESULTS

The results of this study were analyzed in terms of reduction of Pain on Visual Analogue Scale, and improved function on Oswestry Disability Index Questionnaire (ODI).The consort flow chart of the study showed the study organization in terms of subjects screening, random allocation and analysis following the intervention. A total of 100 subjects with Chronic Non Specific Low Back Pain were screened for eligibility, amongst 96 subjects were included in the study trail. All the 96 subjects who met the inclusion criteria had undergone baseline assessment and included subjects were randomized into two equal groups consisting of 48 participants in group A and 48 participants in group B.

In this study 45 participants completed training in group A and 45 participants completed training in Group B with dropouts of 3 in each group, results showed that there is a statistical difference in two groups.

DISCUSSION

The aim of the present study was to evaluate the effectiveness of Graded Activity (Group-A) and Core Stabilization Exercise (Group-B) on pain and Function in subjects with Chronic Non Specific Low Back Pain in this study the subjects were assessed for Pain, and Function using VAS and ODI respectively.

In this study both groups (A and B) Graded Activity and Core Stabilization Exercises showed statistically significant differences within the group and between the group from pre-test to post-test values on reducing Pain and Improving Function in subjects with Chronic Non Specific Low Back Pain. But Graded Activity along with conventional physiotherapy is more effective than Core Stabilization Exercises along with conventional Physiotherapy.

The superior results seen in the Graded Activity group can be attributed to the nature of the intervention itself. Graded Activity (GA) involves a structured, progressive approach that gradually increases the intensity and duration of exercises based on the patient's abilities. GA encourages patients by progressively increasing the difficulty of Exercises; individuals gain a sense of control over their rehabilitation process, which can be a powerful motivator.

Mauricio et al. [31] support this approach, noting that GA helps not only to improve physical fitness but also to modify the patient's attitude toward pain. This cognitive-behavioural component of GA is an important aspect of chronic pain management, as it addresses the psychological factors (such as fear avoidance) that often exacerbate CNSLBP.

A study done by **Hoch et al.** [32] demonstrated that patients with chronic low back pain who participated in a graded activity program experienced reduced pain levels and improved functional outcomes compared to those who received standard care. Graded Activity is often better tolerated and adhered to by patients because of its individualized and less intimidating approach.

Hoch et al., also suggested a major advantage of GA is its patient-cantered design, which often leads to better patient satisfaction and willingness to continue with the program. By tailoring the program to the individual's physical capacity, GA provides a less intimidating and more rewarding rehabilitation experience. This not only improves pain and function but also fosters a positive relationship between the patient and their rehabilitation process.

Macedo, Latimer, et.al., [33] allocated its participants into two groups (graded activity and motor control exercise). The outcomes assessed in this study were pain intensity specific functional, disability, global perceived effect, and quality of life and no between- groups differences were observed in this study GA program helped patients gradually increase their physical activity and participation in daily activities, despite the presence of pain. This led to improvements in pain intensity, disability, and quality of life and MCE program helped patients strengthen the deep stabilizing muscles of the spine, which improved spinal stability and reduced pain.

A Study done by **van der Roe et.al,** [34] compared the effect of graded activity versus guidelines (i.e., physical therapy according to clinical guidelines) in terms of intensity of pain, disability and quality of life where there is no significant difference between the groups The GA program helped patients gradually increase their physical activity and participation in daily activities, despite the presence of pain and PTCG group received a comprehensive physical therapy program that included exercises, manual therapy, and education. This led to improvements in pain intensity, disability, and quality of life in both the Groups.

Core stabilization exercises focus on strengthening the muscles surrounding the spine, enhancing stability and postural control. This type of exercise is particularly popular among athletes and individuals with chronic musculoskeletal issues, as a stable core is essential for optimal movement and injury prevention.

Our study supported by, **Hossein kareem et.al.** [35] Conducted a study on patients with Chronic Non Specific Low Back Pain who participated in Core Stabilization Exercises and Routine exercises and the results of the study shows greater pain reduction in the Core Stabilization Exercises compared to the Routine exercises. In this study, CSE program helped patients Strengthens the core muscles, which improved spinal stability and reduced pain and develop better proprioception, which allowed them to sense and control their spinal movement more effectively.

A Study done by **Akodu et.al.**[36] which concluded that stabilization exercise is effective in the management of pain-related disability, depression, and anxiety in subjects with Chronic Non Specific Low Back Pain. In this study CSE Strengthens the core muscles, which improved spinal stability and reduced pain and proprioception by Reducing muscle

imbalances, which can contribute to Low Back pain and thereby reduces Pain-related fear and anxiety, which can contribute to Chronic Non Specific Low Back Pain.

The underlying mechanism of Graded Activity of Chronic Non Specific Low Back Pain is multifaceted is a progressive approach that addresses both the physical and psychological factors contributing to pain and disability. By promoting gradual exposure to activity, GA helps break the cycle of fear-avoidance, restores muscle strength, endurance, and flexibility, and improves functional capacity. Additionally, the psychological benefits of building confidence, self-efficacy, and reducing pain-related distress are essential for long-term recovery.

Graded Activity not only improves physical functioning but also contributes to the Neuroplastic changes that reduce pain sensitivity and central sensitization, allowing patients to regain normal activity levels without exacerbating pain. As a result, GA offers a comprehensive and effective approach to managing Chronic Non-Specific Low Back Pain by addressing both the physical and psychological barriers to recovery.

On the other hand, Core Stabilization Exercises are effective for many individuals; they may not provide the same level of overall full range of physical and psychological barriers to rehabilitation. One limitation of CSE is its emphasis on isolated muscle strengthening rather than addressing broader functional capabilities, such as endurance, mobility, and aerobic fitness. Additionally, CSE may not be suitable for all patients, particularly those with severe pain or those who are not familiar with exercise.

In this study both the Groups received Moist Hot Packs as the conventional physiotherapy for about 15 minutes. The application of heat in low back pain patients may therefore also involve a normalizing effect on the thoracolumbar fascia. An increase in tissue temperature through the application of heat packs leads to increased metabolism and Vasodilation and accelerates the healing processes.

The results of the study show that Graded Activity Exercises was more effective than Core Stabilization Exercises in reducing pain and Functional ability. In Conclusion, Both groups have shown statistically significant improvement in reducing pain and Functional ability. However Graded Activity Group showed more improvement when compared to Core Stabilization Exercises in reducing pain and Functional ability**.**

CONCLUSION

The Current study concluded that, 6 weeks of Intervention of Graded Activity and Core Stabilization Exercises showed significant improvement on reducing Pain, improving Function in subjects with Chronic Non Specific Low Back Pain. However Graded Activity showed more improvement when compared to Core Stabilization Exercises. From the findings of the current study, it can be recommended that Graded Activity may be opted as a treatment of choice for reducing pain, improving function in subjects with Chronic Non Specific Low Back Pain.

LIMITATIONS

- The study duration is short
- No follow up in the present study
- No blinding of evaluators
- Small Sample Size
- Variables like BMI are not considere

RECOMMENDATIONS FOR FURTHER RESEARCH

- Sample size can be increased
- The duration of the intervention can be increased
- Further studies may be done to investigate the combined effect of Graded Activity and Core Stabilization Exercises for enhanced treatment approaches.

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